

**TAXONOMIC NOTES ON ACAULESCENT OXALIS  
(OXALIDACEAE) IN THE UNITED STATES**

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**ABSTRACT**

A key to species and typification summaries with descriptions, notes on variation, and geography are presented for 10 acaulescent *Oxalis* species occurring in the USA, both native and naturalized: *O. articulata*, *O. caerulea*, *O. debilis*, *O. decaphylla*, *O. drummondii*, *O. intermedia*, *O. latifolia*, *O. metcalfei*, *O. triangularis*, and *O. violacea*. *Oxalis metcalfei* (previously identified in the USA mostly as *O. alpina*) occurs in Arizona, Colorado, New Mexico, and Texas. *Oxalis latifolia* occurs in Arizona, New Mexico, and Texas, at the northern extremity of its range. *Oxalis intermedia*, native to the West Indies, has previously been known to be naturalized in the USA in Florida and is reported here from Louisiana and Texas. *Oxalis debilis* (including *O. corymbosa*) occurs across seven coastal states of the southeastern USA and is reported here for California by a voucher and for Washington by a sight record. *Phytologia* 91(3): 501-526 (December, 2009).

**KEY WORDS:** *Oxalis* sect. *Ionoxalis*, *Oxalis latifolia*, *Oxalis articulata*, *Oxalis debilis*, *Oxalis intermedia*, taxonomy, distribution

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*Oxalis* sect. *Ionoxalis* (Small) R. Knuth includes bulb-producing, acaulescent species with white to blue, purple, or pink flowers. The North American representatives were monographed by Denton (1973), who provided useful insights into a taxonomically difficult group, but problems have remained and identifications have been inconsistent. In Arizona and New Mexico, particularly, where Denton recognized the presence of *O. alpina*, *O. latifolia*, *O. drummondii*, "aff. *O. drummondii*," and *O. violacea*, the present study identifies the same plants as *O. metcalfei* and *O. latifolia*. *Oxalis caerulea* has been a poorly understood and apparently under-collected

species. In the southeastern USA, adventive species of sect. *Ionoxalis* from subtropical and tropical regions are ambiguous in some points of identity and nomenclature. The present study attempts to clarify species identities, nomenclature, and geographic distribution of a number of the North American taxa of sect. *Ionoxalis*. The acaulescent *O. articulata* also is included in the account here, although a member of sect. *Articulatae* R. Kunth.

In the present study, all citations of localities in the USA and Mexico are from specimens examined, unless otherwise specifically noted. Collections were studied from ARIZ, ASU, BRIT-SMU-VDB, GH, MO, NLU, and TEX-LL.

### KEY TO SPECIES

1. Leaflets mostly 4–11, rarely 3.
  2. Leaflets mostly 4(–5), obtriangular to obovate, lobed 1/5–1/2 length, 5–22 mm long; bulb scales (3–)5–7)-nerved .....1. ***Oxalis caerulea***
  2. Leaflets mostly (4–)5–11, mostly narrowly oblong-ob lanceolate to narrowly oblong or linear, lobed (1/5–)1/2–2/3(–9/10) length, (10–)12–38(–72) mm long; bulb scales 9–15+)-nerved .....2. ***Oxalis decaphylla***
1. Leaflets 3.
  3. Leaflets with oxalate dots around the margins or evenly over the lamina, or both.
    4. Plants arising from a thick, woody, irregularly nodulate-segmented rhizome often with persistent, thickened, and lignescent petiole bases; flowers 3–12 in umbelliform cymes, less commonly in irregular cymes.....9. ***Oxalis articulata***
    4. Plants arising from a dense cluster of sessile bulblets; flowers (3–)8–14(–28) in irregular cymes .....7. ***Oxalis debilis***
  3. Leaflets without oxalate dots or tubercles, or with marginal tubercles only on both sides of the notch.
    5. Plants arising from scale-clad rhizomes; leaflets purple

- .....9. **Oxalis triangularis**
- 5. Plants arising from bulbs or bulbs and bulblets, without scale-clad rhizomes; leaflets mostly green.
- 6. Leaflets obtriangular to broadly obtriangular, lobes apically nearly flat; plants arising from a dense cluster of sessile bulblets; southeastern USA (expected in California)
- .....8. **Oxalis intermedia**
- 6. Leaflets obtriangular to obovate, lobes apically rounded to convex; plants arising from a single bulb or a dense cluster of sessile bulblets; eastern to southwestern USA.
- 7. Plants arising from a dense cluster of sessile bulblets; bulb scales 3-nerved; southwestern USA
- .....3. **Oxalis metcalfei**
- 7. Plants arising from a single bulb, rarely producing bulblets at the ends of slender rhizomes; bulb scales 3-nerved or (5-)7-9(-11)-nerved; eastern USA to southwestern USA.
- 8. Bulb scales (5-)7-9(-11)-nerved; southwestern USA
- .....4. **Oxalis latifolia**
- 8. Bulb scales 3-nerved; primarily eastern USA.
- 9. Leaflets without oxalate deposits, obtriangular to obovate, (6-)14-34 mm, lobes divergent, tubercles of sepal apices 2 or 3-6, linear and prominently thickened, apically confluent...
- .....5. **Oxalis drummondii**
- 9. Leaflets consistently with oxalate deposits at the base of the notch, rounded-obovate to obreniform, (5-)8-15(-20) mm, lobes geminate; tubercles of sepal apices 2, linear and narrow, apically confluent
- .....6. **Oxalis violacea**

1. ***Oxalis caerulea*** (Small) R. Knuth, Notizbl. Bot. Gart. Berlin-Dahlem 7: 316. 1919. *Ionoxalis caerulea* Small, N. Amer. Fl. 25: 33. 1907. **TYPE:** USA. New Mexico. Lincoln Co.: Gray, ca. 6000 ft, 7 Jun 1898, *J. Skehan 112* (holotype: NY-digital image!; isotypes: GH!, MO!, NY-digital image!, US-digital image!). The NY and US sheets were annotated by Lourteig in 1988 and 1989 as *O. lunulata* Zucc.

Plants perennial, acaulescent, glabrous, arising from single, brownish bulbs; bulb scales (3–)5–7-nerved. **Leaves** all basal; leaflets (3–)4(–5), obtriangular to obovate, 5–22 mm, lobed 1/5–1/2 length, lobes apically rounded, green above, slightly paler green to purplish beneath, oxalate deposits absent or as a few punctate tubercles near the leaflet lobe apices, petioles 3–10(–13) cm. **Flowers** (1–)2–7 in umbelliform cymes, distylous; scapes 6–12(–15) cm; sepal apices with a pair of linear, orange tubercles; corollas 8–10 mm; petals red to pinkish-lavender. **Capsules** ellipsoid, 3.5–6 mm.  $2n$  = unknown.

Flowering Jun–Sep. Stream beds, creek sides, meadows, pinyon-juniper, pine-oak-juniper, pine-aspen; (1800–)2000–2600 m. Native to Arizona (Apache, Coconino, Graham, Navajo, Pima, and Yavapai cos.), Colorado (Fremont Co.), New Mexico (Catron, Colfax, Grant, Lincoln, San Miguel, and Valencia cos.; Mexico (Chihuahua, Durango, Sonora).

Among the bulb-forming species of the southwestern USA, *Oxalis caerulea* has the smallest plants and leaves. If 4 obtriangular to obovate leaflets are observed, the identity as *O. caerulea* is fairly secure, although 3 and 4 leaflets may sometimes be produced on a single plant. *Oxalis decaphylla* also produces more than 3 leaflets, but if only 4 leaflets, they are larger and differently shaped and the plants generally grow at higher elevations than *O. caerulea*. Denton's key to species (1973, p. 491) emphasized the relative extension of flanges at petiole bases in separating *O. caerulea* and *O. lunulata* Zucc. from other species — this feature, however, is difficult to interpret and the flanges often are damaged or apparently missing.

Type specimens of *Oxalis caerulea* at NY and US were annotated by Lourteig in 1988 and 1989 as *O. lunulata*, and she

included *O. caerulea* as a synonym of *O. lunulata* (Lourteig 2000). Denton (1973, p. 575) noted that "The closest ally to *O. lunulata* is *O. caerulea* which occurs in northern Mexico and southwestern USA. *Oxalis caerulea* is intermediate in morphology between *O. lunulata* and *O. divergens* but is not sympatric with either of those two species." Denton (Fig. 6) mapped *O. caerulea* in Mexico in Durango and Chihuahua, *O. lunulata* from central Zacatecas southward to Guatemala.

Sivinski (2005) noted that *Oxalis caerulea* "is either rare in NM or very difficult to accurately identify." The small size of the plants, perhaps missed in surveys and general collecting, might also contribute to the apparent paucity of the species. Because this species has been poorly known, the following collections are cited, all examined in the current study.

**ARIZONA. Apache Co.:** ca. 5.5 road mi N of Nutrioso and 1.3 mi N on Apache Co. Rd 2116, pinyon-juniper-ponderosa, at hilltop, 7200 ft, 9 Aug 1991, *Christy 824* (ASU). **Coconino Co.:** Coconino Natl. Forest, Upper West Fork Canyon of Oak Creek, ca 10 mi NNE of Sedona, short ways down Fernow Draw from Forest Service Rd 231, first confluence, within northern section of Red Rock/Secret Mt. Wilderness, open field, 6500 ft, 2 Sep 2001, *Gilbert 830* (ASU); Coconino Natl. Forest, Upper West Fork Canyon of Oak Creek, canyon mouth located 15 km N of Sedona, ca. 0.5 mi down Casner Cabin Draw from wilderness boundary, seasonal stream bed, 6600 ft, 10 Aug 2002, *Gilbert 948* (ASU); Flagstaff, 7000 ft, 26 Sep 1923, *Hanson 729* (MO); Flagstaff, 10 Aug 1910, *Irish 10155* (ARIZ); Houston Draw, open meadow in coniferous forest, 2194 m, 3 Aug 1989, *Knight 369* (ASU); Flagstaff, 6900 ft, 5 Aug 1936, *Sneddan s.n.* (ARIZ); Flagstaff, 12 Aug 1907, *Thorner s.n.* (ARIZ); Flagstaff, 20 Jul 1930, *Thorner s.n.* (ARIZ, SMU); Flagstaff, near Museum, 7100 ft, 11 Aug 1935, *Whiting 756/1466* (ARIZ). **Graham Co.:** Coronado Natl. Forest, Soda Water Spring Canyon, Madrean oak woodland along creek, *Q. hypoleucoides*, *Q. emoryi*, *Pinus cembroides*, *Juniperus deppeana*, *Arctostaphylos pungens*, NE aspect, 5900 ft, 2 Aug 1999, *Buegge 1005* (ASU). **Navajo Co.:** White Mt. Apache Reservation, ca. 12 mi E of Seven Mile School at Crooked Creek, pine-aspen, boggy area along stream, 27 Jul 1975, *Lane 1610* (ASU). **Pima Co.:** Rincon Mts., 7900 ft, 20 Sep

1909, *Blumer 3381* (MO). **Yavapai Co.:** near Prescott, 8 Aug 1926, *Peebles et al. 2657* (ARIZ). **COLORADO. Fremont Co.:** Texas Cr., Aug 1879, *Brandege 875* (MO). **NEW MEXICO. Catron Co.:** 7 mi W of Red Hill, ponderosa pine forest, 7000 ft, 12 Aug 1964, *Kral 21844* (VDB). **San Miguel Co.:** near Pecos, 6700 ft, 19 Aug 1908, *Standley 5099* (MO). **Valencia Co.:** no other locality information, 22 Aug 1939, *Vestal 94* (GH). **County unknown:** 1847, *Fendler 91* (GH-3 sheets, MO). Denton (1973) also cited the following collections of typical *O. caerulea* from New Mexico: **Catron Co.:** near Luna, *Eggleston 20254* (NY, US). **Colfax Co.:** vicinity of Ute Park, *Standley 13754* (US). Emshwiller et al. (in press) record McKinley Co., N.M., in the range of the species.

Denton (1973, pp. 507–508) identified and cited some collections as “aff. *O. caerulea*,” “a subtle variant which is a putative hybrid between *O. drummondii* and *O. caerulea*. The leaves have 3–4 leaflets which may be abnormally trilobed. Practically all of the pollen was shriveled, only 1–2 percent was normally shaped and accepted the stain in an aniline blue pollen preparation.” She cited these: **NEW MEXICO. Colfax Co.:** vic. of Ute Park, 2 Sep 1916, *Standley 14255* (US). **Grant Co.:** Santa Rita del Cobre, copper mines, Aug 1851, *Wright 908* (GH, NY). **San Miguel Co.:** near Pecos, 19 Aug 1908, *Standley 5099* (NY, US). Some of the collections examined in the present study from around Flagstaff (Coconino Co., Arizona) and elsewhere apparently are similar in leaf morphology to these “variants,” but neither the present study nor Denton’s has recognized the occurrence of *O. drummondii* in New Mexico or northern Arizona, and it is unlikely that genes of that species are involved. The pollen inviability and putatively abnormal leaf morphology probably are related to something other than hybridization.

2. ***Oxalis decaphylla*** Kunth in A. Humboldt et al., *Nov. Gen. Sp.* 5(qto.): 185. 1822. **TYPE:** MEXICO. “Crescit in planitie Mexicana, prope rupem El Peñon, alt. 1170 hex.,” *Bonpland 4170* (holotype: P; isotype: P). Fide Denton (1973).

*Ionoxalis grayi* Rose, *Contr. U.S. Natl. Herb.* 10: 112. 1906. *Oxalis grayi* (Rose) R. Knuth, *Notizbl. Bot. Gart. Berlin-Dahlem* 7: 317. 1919 (non Tidestrom 1923). **Type:** USA. New Mexico. No other

locality data, 1851, *C. Wright 909* (holotype: US, digital image!, fragment NY; isotype: GH!).

Plants perennial, acaulescent, rarely without leaves, glabrous, arising from brownish, heavily fibrous bulbs; bulb scales 9–15+nerved. **Leaves** all basal; leaflets (3–)5–11, mostly narrowly oblong-ob lanceolate to narrowly oblong or linear, (10–)12–38(–72) mm, lobed (1/6–)1/2–2/3(–9/10) length, lobes apically subacute, bright green above, slightly paler green to purplish beneath, oxalate deposits absent, petioles 7–32(–46) cm. **Flowers** (2–)6–11(–15) in umbelliform cymes, distylous; scapes 7–35 cm; sepal apices with thick, linear, orange tubercles; corollas (7–)9–17(–22) mm, rose-purple or lavender to pink, rarely white. **Capsules** ellipsoid, 3–11 mm.  $2n = 28, 56$  (counts from Mexico; Weller & Denton 1976).

Flowering Jun–Aug. Sycamore-walnut, oak, pine-oak, ponderosa pine, pine-spruce-aspens, spruce-fir, canyons, meadows, seeps, streamsides; (1700–)2200–3000(–3200) m. Native to Arizona (Apache, Cochise, Coconino, Gila, Greenlee, Navajo, Pima, Santa Cruz, and Yavapai cos.), New Mexico (Catron Co.), and Mexico (south to southwestern and central states).

Leaflets of *Oxalis decaphylla* are heteroblastic (Denton 1973), changing form from juvenile to mature stages of a single plant, and also variable in adult form, especially in width and number of lobes.

**3. *Oxalis metcalfei*** (Small) R. Knuth, Notizbl. Bot. Gart. Berlin-Dahlem 7: 314. 1919. *Ionoxalis metcalfei* Small in N.L. Britton et al., N. Amer. Fl. 25: 39. 1907. **TYPE:** USA. New Mexico. [Socorro Co.]: Mogollon Mountains, Mogollon Creek, ca. 7500 ft., 23 Jul 1903, *O.B. Metcalfe 299* (holotype: NY-digital image!; isotypes: ARIZ!, GH!, MO!, US-digital image!).

*Ionoxalis monticola* Small, N. Amer. Fl. 25: 42. 1907 [non Arechav. 1900]. *Oxalis neomexicana* R. Knuth [nom. nov.], Notizbl. Bot. Gart. Berlin-Dahlem 7: 315. 1919. **TYPE:** USA. New Mexico. Grant Co.: in and around the S end of the Black Range, Iron Creek, hillside, ca. 7800 ft, 12 Aug 1904, *O.B. Metcalfe 1220* (holotype: NY, digital image!; isotypes: GH!, MO!, digital image!, US, digital image!).

*Oxalis bulbosa* A. Nelson, Amer. J. Bot. 23: 269. 1936. **TYPE:** USA. New Mexico. [Sandoval Co.]: on the gravelly soils of creek banks, the Univ. Camp, Jemez Springs, [silt soils adjacent to the Jemez River], 20 Aug 1931, A. Nelson 11609 (holotype: RM, digital image!).

Plants perennial, acaulescent, glabrous, arising from a primary bulb (sometimes not evident) 5–10 mm long and a cluster of ovoid bulblets 3–4 mm long; bulb scales 3-nerved. **Leaves** all basal, leaflets 3, obtriangular-obcordate, 11–25 mm, lobed 1/6–1/3 length, lobes rounded to shallowly convex, green on both surfaces, oxalate deposits in a thin, marginal band 0.5–1.5 mm long on both sides of the notch base, sometimes evident on one surface but not the other, rarely apparently absent; petioles 7–15 cm. **Flowers** 3–7 in umbelliform cymes, tristylous and distylous; scapes 7–22 cm, peduncles 15–25 cm, pedicel 20–30 mm; sepal apices with a pair of orange, narrow-elongate, non-confluent tubercles; corollas (9–)12–16 mm, petals purplish to lavender or pink. **Capsules** cylindric, 6 mm.  $2n = 28$  in Arizona and New Mexico,  $2n = 42$  only in New Mexico (Weller & Denton 1976).

Flowering Jun–)Jul–Sep(–Oct). Stream sides, wet meadows, canyon bottoms, talus, rocky banks, crevices, juniper-chaparral, *Cercocarpus*, pine, yellow pine-doug fir-oak, douglas fir-aspen, pine-white fir-douglas fir, spruce-fir, spruce; 1800–3100(–3400) m. Native to Arizona (Apache, Cochise, Coconino, Gila, Graham, Greenlee, Pima, Santa Cruz, and Yavapai cos.), Colorado (La Plata Co.; also Archeluta, Hinsdale, and Mineral cos., fide Emschwiller et al. in press), New Mexico (Bernalillo, Catron, Grant, Otero, Sandoval, Sierra, Socorro, and Taos cos.; also Colfax Co., fide Welle & Denton 1976), Texas (Jeff Davis Co.), and Mexico (Chihuahua, Durango, Sonora, Zacatecas).

*Oxalis metcalfei* is common in Arizona and New Mexico but in Texas is known from only two collections: Jeff Davis Co.: Davis Mts., N slope and summit of Mt. Livermore, moist soil of ledges, 29 Jun 1946, *Cory* 13523 (SMU); Mt. Livermore, 22 Sep 1934, *Hinckley s.n.* (TEX).

In Nelson's description of *Oxalis bulbosa* (1936), he described the habit: "bulblets 50 or more crowded in a subspherical mass 12–20



mm in diameter and largely concealing the crown scales; bulblets small, easily detached at maturity, ovoid to subspherical, 2–4 mm in diameter, very compact.” In the southwestern USA, the presence of bulblets on a montane *Oxalis* provides an unequivocal identification as *O. metcalfei*, in distinction to *O. latifolia*, the only other 3-foliolate species in the area with a similar aspect. If only the primary bulb (or a single small bulb/bulblet) is present, the bulb scales of *O. metcalfei* are 3-nerved (vs. 5–7(–11)-nerved in *O. latifolia*). If the specimen does not include below-ground parts, observation of oxalate deposits on the leaves can confirm the identification as *O. metcalfei* — the narrow oxalate deposits sometimes are difficult to discern or perhaps even absent, but they are never produced on leaves of *O. latifolia*. Specimens from ARIZ annotated as *O. metcalfei* and *O. latifolia* are shown in the database at ARIZ Herbarium (2009); those from ASU will be shown on SEINET (2009).

*Oxalis metcalfei* has mostly been identified as *O. alpina* (Rose) Rose ex R. Knuth (e.g., Denton 1973; numerous publications by Weller and collaborators; Ornduff & Denton 1998; Emshwiller et al. in press). The type of *O. alpina* is from south-central Mexico (see citation below), and I have not seen evidence that the species reaches northwestern or northeastern Mexico. Denton’s map (1973, Fig. 5) shows a wide hiatus in distribution between her records in the southwestern USA and northern Chihuahua and Sonora (*O. metcalfei*) and those mostly in central and southwestern Mexico (*O. alpina sensu stricto*).

The similarity of *Oxalis metcalfei* to *O. alpina* is confirmed in the present study, but morphological differences are shown in the following contrast.

- a. Leaflets with dot-like oxalate deposits scattered through lamina, concentrated near margins, or as continuous, filiform marginal bands around the lobe apices, sometimes apparently absent; corollas mostly white.....**Oxalis alpina**
- a. Leaflets with oxalate deposits as a filiform, marginal band 0.5–1.5 mm long on both sides of the notch base, rarely apparently absent; corollas mostly purplish to lavender or pink.....**Oxalis metcalfei**

The significance of these features in recognizing *O. alpina* was emphasized by Denton (1973, p. 503), who noted that *O. jacquiniana* Kunth is usually distinguished from *O. alpina* by the lack of oxalate deposits on the leaflets and that "in western Mexico, a few populations of *O. galeottii* [Turcz.] resemble *O. alpina* by having white flowers ... ." Denton's identification of some collections of *O. metcalfei* in Arizona as *O. violacea* perhaps reflected their similarity in producing oxalate deposits at the base of the leaflet notches. In view of their morphological distinction and their geographical separation, *O. metcalfei* and *O. alpina* are justifiably treated as distinct species.

Weller (1976, p. 124) described *Oxalis alpina* as having "the most extensive natural distribution of any species in section *Ionoxalis*" and he viewed the northwestern population system (treated here as *O. metcalfei*) as having attained its present distribution by northward migration from ancestral populations in southern Mexico. He more recently has noted (Weller et al. 2007, p. 974) that "Cytogeographic studies, which have shown that the haploid chromosome number varies from 7 to 42, suggest that *O. alpina* is not monophyletic (Weller and Denton, 1976). In contrast, populations in the Sky Island region of Arizona, New Mexico, and Sonora are likely to be monophyletic based on similar morphology, uniform tetraploidy (Weller and Denton, 1976), and production of viable hybrid seed (Weller, 1978)." Regarding the recent statement, evidence does not appear in any of Weller's publications to support his observation that *O. alpina* is non-monophyletic, unless it is simply the occurrence of polyploidy, nor have his studies provided any morphological comparison between typical *O. alpina* in south-central Mexico and the northern "*O. metcalfei*" variants. Nor is the observation of "uniform tetraploidy" true, since both tetraploids and hexaploids of *O. metcalfei* occur in the Mogollon Range of southeastern New Mexico (Catron and Grant cos.), part of the "Sky Island" region. Hexaploids in *O. metcalfei* apparently occupy the far-eastern portion of the range, compared to the more widely distributed tetraploids, and their morphological identity with the tetraploids suggests that they arose from the latter.

Tristyly appears to be primitive in *Oxalis*, based on the predominance of that condition in diploid endemic species of southern Mexico and the occurrence of distyly mostly in species with broader

distributions and higher ploidy levels (Weller & Denton 1976). Populations of *Oxalis metcalfei* in Arizona, New Mexico, and Chihuahua are tristylous, distantly separated from the closest tristylous populations of any species in Mexico (see Weller & Denton 1976, Fig. 1). Based on success of inter-populational crossing, Weller (1978) hypothesized that distylous populations of *O. metcalfei* are derived from tristylous ones in the same region. The distylous populations apparently are restricted to Arizona (Weller 1979; Weller et al. 2007), in the region where only tetraploidy has been reported.

*Oxalis alpina* (Rose) Rose ex R. Knuth, Notizbl. Bot. Gart. Berlin-Dahlem 7: 315. 1919. *Ionoxalis alpina* Rose, Contr. U.S. Natl. Herb. 10: 110. 1906. **TYPE:** Mexico. Edo. Mexico. Sierra de las Cruces, fir woods, 10,000 ft, 13 Aug 1896, C.G. Pringle 6439 (holotype: US-digital image!; isotypes: GH!, MO!, NY-digital image!, US-digital image!).

**4. *Oxalis latifolia*** Kunth in Humboldt, Bonpland & Kunth, Nov. Gen. Sp. 5[qto.]: 237, plate 467. 1821 [1822]. *Acetosella violacea* subsp. *latifolia* (Kunth) Kuntze, Rev. Gen. Pl. 1: 90. 1891. *Ionoxalis latifolia* (Kunth) Rose, Contr. U.S. Natl. Herb. 10: 113. 1906. **TYPE:** Mexico: crecicit prope Campeche, no date, *Humboldt and Bonpland s.n.* (holotype: P fiche!; possible isotype: B-Willdenow 8975 fiche!). The leaves of the B-Willdenow specimen are folded but appear to be different in shape from the holotype.

*Oxalis divergens* var. *amplifolia* Trel. in A. Gray, Synopt. Fl. N. Amer. 1(1): 368. 1897. *Oxalis amplifolia* (Trel.) R. Knuth, Notizbl. Bot. Gart. Berlin-Dahlem 7: 314. 1919 (non [Trel.] Tidestrom 1923). *Ionoxalis amplifolia* (Trel.) Rose, Contr. U.S. Natl. Herb. 10: 110. 1906. **LECTOTYPE** (Denton 1973, p. 532): USA. Arizona. [Pima Co.]: Santa Rita Mts., 1828 m, 9 Jul 1881, C.G. Pringle 300 (GH!). In the 1897 description of var. *amplifolia*, Trelease regarded it as "n. comb." and cited as a synonym "O. latifolia, Trelease, [Mem. Boston Soc. Nat. Hist. 4: 91. 1888], t. 11, f. 12, not HBK," but in the 1888 publication he had identified the taxon as "10. *O. latifolia*, HBK., Nov. Gen., v. 237, Pl. 467, VAR." If he intended to describe a new variety in 1888, it was an illegitimate attempt since he did not provide an epithet. Thus, the name in Gray's treatment is regarded as a new variety, not a comb. nov. or a nom. nov., and the name "O.

*latifolia* Trelease" has no standing. Denton's lectotypification remains valid, but for *O. divergens* var. *amplifolia*.

Plants perennial, acaulescent, glabrous, from a single bulb, bulb scales (5-)7-9(-11)-nerved, inner thickened and white with hyaline margins. **Leaves** all basal; leaflets 3, obtriangular to obovate, (15-)25-40 mm, lobed 1/5-1/2 length, lobes apically rounded, green on both surfaces, oxalate deposits absent; petioles (6-)10-25 cm. **Flowers** (3-)6-10(-12) in umbelliform cymes, tristylous, rarely homostylous; scapes (7-)10-20(-30) cm; pedicels (5-)10-20(-35) mm; sepal apices with a pair of short to elongate, non-confluent, orange tubercles; petals 9-12 mm, purple to lavender or pink. **Capsules** cylindric, 4-6 mm, glabrous.  $2n = 14, 28, 42$  (all counts from Mexico, fide Weller & Denton 1976).

Flowering Jun-Sep(-Oct). Rocky slopes, ledges and crevices, ridge tops, canyons, sandy washes, floodplains, mesquite-baccharis, mesquite-acacia, hackberry-willow, oak-juniper-pinyon, oak-maple, pine-oak woodlands; (1100-)1300-2200(-2800) m. Native to the southwestern USA — Arizona (Cochise, Navajo, Pima, and Santa Cruz cos.), New Mexico (Colfax, Otero, San Miguel, and Taos cos.), and Texas (Brewster, Culberson, and Jeff Davis cos.), Mexico (Chihuahua, Coahuila, Durango, Nuevo León, San Luis Potosí, Sonora, Tamaulipas, Zacatecas, and southward to Chiapas), and Central America; reported to be naturalized in California and on other continents, but identities of these plants all need to be verified.

Collections of *Oxalis latifolia* Kunth (as identified here) from northern Mexico, southwestern Texas, eastern New Mexico, and southern Arizona were identified by Denton (1973) as *O. alpina*, *O. drummondii*, and "*O. aff. drummondii*." *Oxalis drummondii* as mapped by Ornduff and Denton (1998, Fig. 2B) almost certainly is *O. latifolia*. *Oxalis latifolia* sensu stricto occurs widely in Mexico north to all states bordering the USA. Populations in northern Mexico and the USA tend to have more rounded leaflets and apparently do not produce bulblets — they perhaps ultimately may be better identified by a different name, but they are neither *O. alpina* (with bulblet production) nor *O. drummondii* (with 3-nerved bulb scales and different leaf morphology). Denton (1973, p. 572) observed that *O. latifolia* "is probably composed

of a number of races and perhaps includes a number of introgressants with other species.”

Lourteig (2000) recognized four subspecies of *Oxalis latifolia* — her concept of subsp. *latifolia* restricted it to South America and the West Indies (even though the type was collected in Mexico); subsp. *schraderiana* (Kunth) Lourteig is entirely South American; subsp. *vespertilionis* (Zucc.) Lourteig occurs in montane Mexico south to Guatemala; subsp. *galeottii* (Turcz.) Lourteig is the expression that she recognized as occurring into the USA. In contrast, most others, including Denton (1973), have treated *O. galeottii* Turcz. as a distinct species of central and southern Mexico, broadly sympatric with *O. latifolia*.

**5. *Oxalis drummondii*** A. Gray [nom. nov.], Smithsonian Contr.

Knowl. 5(6): 25. 1853. *Oxalis vespertilionis* Torrey & A. Gray, Fl. N. Amer. 1: 679. 1840 (non Zucc. 1834). **TYPE:** USA. Texas. No other locality data, *T. Drummond III*. 8 (holotype: NY, NY-digital image!). *Oxalis latifolia* subsp. *vespertilionis* (Zucc.) Lourteig (Bradea 7: 591. 2000), a South American taxon, is heterotypic with *O. drummondii*.

Plants perennial, acaulescent, arising from a scaly bulb, glabrous; bulb scales 3-nerved, margins villous-ciliate on distal 1/3–1/2. **Leaves** all basal; leaflets 3, obtriangular to obovate, (6–)14–34 mm, lobed 1/4–4/5 length, lobes apically convex to nearly truncate, green on both surfaces, sometimes adaxially with red splotches in an irregular medial band, oxalate deposits absent, petioles 5–16 cm. **Flowers** 3–10 in umbelliform cymes, distylous or rarely homostylous; scapes (7–)11–23 cm; sepal apices with a pair (or 3–6) of orange, thickened, apically confluent tubercles; petals (8–)15–23 mm, pink to violet or purple-violet. **Capsules** cylindric, 4–12 mm, pubescent.  $2n = 14$ .

Flowering Mar–Nov; sandy-gravelly soil, limestone soil, disturbed areas, prairies, limestone hills, open woodlands, chaparral; 20–300 m. Native to Texas and Mexico (Chihuahua, Coahuila, Durango, Nuevo León, Sonora, Tamaulipas).

*Oxalis drummondii* is recognized by the production of a single bulb with 3-nerved scales, obtriangular leaflets, large flowers, and thick

tubercles at the sepal tips. Attributions of this species to Arizona and southern New Mexico apparently are based on identifications by Denton (1973) of plants from those states as *O. drummondii* and "aff. *O. drummondii*." These collections are identified here mostly as *O. latifolia*. Denton (1973) cited, but did not map, a historical collection (NY) from Oklahoma as *O. drummondii*, significantly disjunct northward from its main range. Recent accounts of the flora of the state have not included the species.

*Oxalis madrensis* Rose (= *O. leonis* R. Knuth), listed by Denton (1973) as a synonym of *O. drummondii*, is instead a distinctive species (bulblets numerous, bulb scales 5–9-nerved, flowers large, blue, 8–12 per scape), apparently restricted to high elevation habitats in northeastern Mexico and probably closely related to *O. alpina* (Nesom in prep).

**6. *Oxalis violacea* L., Sp. Pl. 1: 434. 1753. *Acetosella violacea* (L.) Kuntze, Revis. Gen. Pl. 1: 90. 1891. *Ionoxalis violacea* (Linnaeus) Small, Fl. S.E. U.S. 665, 1332. 1903. LECTOTYPE** (Reveal in Jarvis 2007, p. 717). *Kalm s.n.*, Herb. Linn. No. 600.12 (LINN). The protologue noted "Habitat in Virginia, Canada."

Plants perennial, acaulescent, arising from a single bulb, rarely producing slender, scale-leaved rhizomes with a bulblet at the tip of each, glabrous, rarely without leaves; bulb scales 3-nerved, margins villous-ciliate on distal 1/3–1/2. **Leaves** all basal; leaflets 3, rounded-obcordate to obreniform, (5–)8–15(–20) mm, lobed 1/4–1/3 length, lobes apically convex, bright green above, often with a purplish, lateral band, slightly paler green to purple beneath, oxalate deposits along the margins only at the base of the notch, petioles (4–)7–13(–24) cm. **Flowers** (1–)2–8(–19) in umbelliform cymes, distylous; scapes (6–)9–23(–31) cm; sepal apices with a pair of narrow, orange, apically confluent tubercles; petals 10–18 mm, rose-purple or lavender to pink or white. **Capsules** ovoid, 4–5 mm.  $2n = 28$ .

Flowering Apr–May(–Jul) (with leaves) and Aug–Oct (usually without leaves, following rains). Sandy soil, gravelly soils, prairies, limestone glades, hills of granite, limestone, and rocky-clay, rock outcrops, bluffs, bottomland, oak-pine, oak-hickory, live oak, juniper woodland, cutover pine, roadsides, disturbed sites, abandoned fields;

50–400(–1000) m. Native to the eastern USA (Alabama, Arkansas, Connecticut, Delaware, District of Columbia, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Massachusetts, Maryland, Michigan, Minnesota, Missouri, Mississippi, Nebraska, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Virginia, Vermont, West Virginia, and Wisconsin) and Mexico (Coahuila).

*Oxalis violacea* is restricted in its native range to the eastern USA (barely into Mexico, see below), reaching westward as far as the line of states from North Dakota to Texas. Plants identified by Denton (1973) as *O. violacea* and “aff. *O. violacea*” from Arizona and New Mexico are identified here as *O. metcalfei* and *O. latifolia*. It is possible that her identifications were influenced by an emphasis on the oxalate deposits in the leaflet notches, which occur in *O. violacea* and in *O. metcalfei*, although there is a distinct difference in the morphology and placement of the deposits. Similarly, reports of naturally occurring *O. violacea* in Colorado are based on misidentifications (see county citations from Colorado, above; CU Museum 2009; Emshwiller et al. in press). In noting its occurrence in Wyoming (Dorn 2001, p. 259) observed that it has been “collected only once, in 1881 or 1882” in Yellowstone National Park — if correctly identified, this record surely was from a planting. Denton (1973, p. 606) cited the collection: “Wyoming: Park Co: [not mapped, probably introduced] Yellowstone Nat. Park, fl. 1881-1882, *Forwood US-317388* (US).”

Young (1958, p. 63) noted that “There is no evidence that [*Oxalis violacea*] has ever occurred in Britain as a wild plant, and it should be removed from the British list. Chevalier (1940, p. 682) was likewise of the opinion that French records for it were erroneous.” Liogier (1988) reported that *Oxalis violacea* is “cultivated and escaped in Puerto Rico” — collections have not been seen in the present study to confirm or dispute that.

Denton (1973) did not report *Oxalis violacea* in Mexico, but two collections unequivocally identified as that species have been made from northern Coahuila along the Rio Grande, immediately across the river from eastern Brewster County, Texas. These two sites are only

slightly southwest from an apparently disjunct locality at the southwestern extremity of the USA range of *O. violacea*. **Texas.** Val Verde Co.: ca. 10 mi W of Comstock on U.S. Highway 90, floor of Seminole Canyon, ca. 0.5 mi above its confluence with Presa Canyon, Seminole Canyon State Historical park, 16 Oct 1988, *Labus 379* (TEX).

**Mexico. Coahuila.** In hills just across the river from mouth of Maravillas Creek, Black Gap Wildlife Management Area (Brewster Co.), 29° 33' 29-34"N, 102° 45-46"W, steep limestone slopes of Rio Grande canyon and tributaries, 500-950 m, *Dasyllirion*, *Agave*, *Acacia*, *Larrea*, 6 Apr 1973, *Johnston et al. 10589½N* (TEX); one of the deepest parts of Boquillas Canyon, below (downstream from) Cave of the Blessed Virgin, 29° 13'N, 102° 54' 30"W, very steep limestone slopes, 770 m, *Dasyllirion*, *Agave*, *Karwinskia*, *Hechtia*, 19 Oct 1973, *Johnston et al. 12359* (TEX).

**7. *Oxalis debilis*** Kunth in A. Humboldt et al., Nov. Gen. Sp. 5(qto.): 236. 1821. *Acetosella debilis* (Kunth) Kuntze, Rev. Gen. Pl. 1: 92. 1891. **TYPE:** Venezuela. Inter La Venta Grande et urbem Caracas, alt. 550 hex, Jan 1800, *Humboldt & Bonpland [681]* (holotype: P fiche!).

*Oxalis martiana* Zucc., Denkschr. Königl. Akad. Wiss. München 9: 144. 1825. *Ionoxalis martiana* (Zucc.) Small, Fl. S.E. U.S. 665. 1903. **TYPE:** Brazil. Rio de Janeiro, prope Sebastianopolis, *Martius s.n.* (holotype: M). Fide Denton (1973) and Lourteig (2000).

*Oxalis corymbosa* DC., Prodr. 1: 696. 1824. *Oxalis debilis* var. *corymbosa* (DC.) Lourteig, Ann. Missouri Bot. Gard. 67: 840. 1980 [1981]. *Oxalis debilis* subsp. *corymbosa* (DC.) O. Bolòs & Vigo, Fl. Països Catalans 2: 286. 1990. **LECTOTYPE** (Lourteig 1981): Insula Borbona etc. (G-DC fiche!). The protologue noted "in ins. Borboniae et Mauritiï" — Bourbon Island, now called Réunion, is a volcanic island east of Madagascar and southwest of Mauritius. Marais (1987) noted that *O. debilis* occurs on three of the Mascarene Islands (La Réunion, Maurice, Rodrigues) and is an "Espèce Sud-américaine, anciennement introduite et naturalisée (un échantillon de Commerson du Gol à La Réunion, de 1771)."

Plants perennial, acaulescent, moderately villous to glabrate, arising from a dense cluster of sessile bulblets; bulb scales 3-nerved. **Leaves** all basal; leaflets 3, rounded-obcordate, 17-40(-50) mm, lobed



1/6–1/5 length, lobes apically convex, adaxially hirsute, green to yellowish-green on both surfaces, oxalate deposits usually tiny, often dark, distributed at least around margins of distal 1/3 and often evenly over whole surface, petioles 10–25 cm. **Flowers** (3–)8–14(–28) in irregular cymes, mostly homostylous in North America or infrequently tristylous; scapes 15–28 cm; sepal apices with a pair of orange tubercles; petals 10–16(–20) mm, violet to lavender or rose-purple. **Capsules** not observed, apparently sterile in North America.  $2n = 14$  and 28, 35 rarely, and dysploids reported (see Luo et al. 2006 for a summary; no counts known from North America).

Flowering Dec–May, rarely again in the summer. Fencerows, yards, flower beds, roadsides, disturbed areas, hammock margins, sandy live oak woods, mesic woods, creek and river terraces; 5–100 m. Native to South America. Naturalized in California and Washington and in the southeastern USA (Alabama, Florida, Georgia, Mississippi, Louisiana, South Carolina, and Texas); naturalized also in Mexico, Bahamas, West Indies, Central America, Europe, southeastern Asia, Australia, and various Pacific Islands.

The range *Oxalis debilis* in the USA is extended here to include **California**: Marin County: Bolinas, weed in Dennis Breedlove's garden, 3 May 1993, *Best 1459* (CAS). In August 2008, I observed *Oxalis debilis* growing in a garden, apparently without cultivation, at the University of Washington Botanical Gardens in Seattle, Washington. As I was looking closely at the plants, a Seattle resident told me that this species was an abundant weed in and around his home there. The occurrence of the species in Washington, however, apparently has not been documented by a voucher.

*Oxalis debilis* is known as a naturalized element of the USA flora primarily in coastal states of the Southeast, from South Carolina to Georgia and Florida and westward to Texas. It usually can be unequivocally identified by its acaulescent habit, the plants arising from a cluster of small, sessile bulblets, its large, rounded leaflets with tiny, dark, oxalate deposits scattered evenly over the surface and/or crowded near the margins, and its purplish to violet flowers in an irregularly cymose inflorescence. In addition to those in the basal cluster, bulblets apparently also can be formed at the tips of filiform roots or rhizomes.

Plants can form large, dense colonies and the species appears to be aggressively spreading in the USA. Lourteig (1981, p. 841) noted that "This is a South American species widespread in the whole world, occasionally fruiting but reproducing through abundant bulbils developing simultaneously."

*Oxalis debilis* most commonly has been identified as *O. corymbosa* or *O. debilis* subsp. *corymbosa*. In expanding *O. debilis* to include *O. corymbosa* at varietal rank, A. Lourteig (1981) provided no comment in explanation, but as later described by her (2000), the two taxa are differentiated primarily by the distribution of oxalate deposits in the leaf lamina. In *O. debilis*, the dot-like deposits are crowded along the margins and absent to distinctly less abundant elsewhere. In *O. corymbosa*, the deposits are evenly distributed over the whole lamina. In their native range in South America, the two expressions are broadly sympatric and intermediates are common, as they are in the USA. *Oxalis corymbosa* sensu stricto appears to be the more commonly naturalized form, but the *O. debilis* expression occurs at least in North America, Asia, Africa, and Central America (collections at MO). Intermediates have the oxalate "dots" along the margins as well as over the whole surface or sometimes mostly on the outer third of the blades, near the margins. Annotations by Lourteig tend to identify both expressions as "*O. debilis* var. *corymbosa*." Without more convincing evidence that the variation is not populational in nature, all plants are identified here simply as *O. debilis*. An analogous pattern of variability in distribution of foliar oxalate 'dots' occurs at least in *O. alpina* (Rose) Rose ex R. Knuth of central Mexico and in the more widely distributed *O. tetraphylla* Cav.

8. ***Oxalis intermedia*** A. Rich., Hist. Phys. Cuba, Pl. Vasc. 315. 1841.  
*Ionoxalis intermedia* (A. Rich.) Small, N. Amer. Fl. 25: 43. 1907.  
**TYPE:** Cuba, no date, *de la Sagra s.n.* (holotype: P; isotype: P).

Plants perennial, acaulescent, rarely without leaves, glabrous or sparsely pubescent, arising from a cluster of brownish sessile-appearing bulblets or a bulb producing numerous slender stolons with bulblets at the apices; bulb scales (3-)5-7-nerved. **Leaves** all basal; leaflets 3, obtriangular to broadly obtriangular, 20-50 mm, lobed 1/5-1/3 length, lobes apically truncate, bright green above, paler beneath,

oxalate deposits absent; petioles 10–22 cm. **Flowers** 3–12(–18) in umbelliform cymes, semi-homostylous; scapes 7–30 cm; sepal apices with a pair of orange tubercles; petals 8–12 mm, usually lavender to purple, less commonly pink or white. **Capsules** ellipsoid, 3–8 mm, glabrous, usually seed-sterile and without fruit.  $2n =$  unknown.

Flowering Apr–Sep. Gardens, lawns, fields, orchards, roadsides, fencerows, moist waste areas; 5–100 m. Native to the West Indies. Naturalized in California, Florida, Louisiana, and Texas; naturalized also in Mexico (Chiapas, San Luis Potosí, and Veracruz). Adams (1988) described the Caribbean range as “Bahamas, Cuba, Puerto Rico, Virgin Is. and southwest to Martinique, also in Trinidad.”

The type collection of *Oxalis intermedia* was made in Cuba and the native range of the species is in the West Indies. It previously has been known as a naturalized member of the USA flora from Florida (Small 1933; Wunderlin & Hansen 2009; USDA, NRCS 2008). The range of the species in the USA is extended here by reports of collections made from California, Louisiana, and Texas. It also has been collected from Massachusetts, but it has not been confirmed as naturalized since the original collection. The species (as *O. latifolia* Kunth) is reported by Wunderlin and Hansen (2009) to occur in 14 additional counties of Florida; a representative collection is cited below for the state. In addition to its naturalization along the Gulf Coast of the USA, *O. intermedia* also grows outside of cultivation in Veracruz (Denton 1973) and San Luis Potosí (SMU!), Mexico.

**California.** Marin Co.: garden at Ross Station, 3 Jun 1934, *Eastwood s.n.* (GH); weed in garden at [Ross] Station, 5 Aug 1934, *Rose 34459* (GH). **Florida.** Alachua Co.: locally common in shaded, rich loamy soil of hammock just NE of state park office bldg., Alachua Sink—Paynes Prairie State Preserve, on SSE side of Gainesville, 27 Jun 2000, *Anderson 19359* (MO). **Louisiana.** East Baton Rouge Par.: [city of Baton Rouge]: infrequent in oak woods 1 mi S of Louisiana State University on Nicholson Drive, plants never observed flowering, 22 Feb 1975, *McReynolds s.n.* (MO); in a ditch at the intersection of Acadian Thruway and I-12, 24 Sep 1974 [sterile], *McReynolds s.n.* (MO); Concordia Par.: Haphazard Plantation, off La. 566, 11 Aug 1971, *Thomas et al. 24560* (NLU). **Massachusetts.** Essex Co.:

Newburyport, around greenhouses, subhardy, Oct 1940, *McGregor s.n.* (GH). **Texas.** Webb County: Laredo, sandy soil, 23 Feb 1964, *Arizmendi 33* (LL); Laredo, sandy loam, 24 Nov 1962, *Solis 102* (TEX); Laredo, Sanders Street, hard-packed loam, 27 Nov 1961, *Vega and Hilario s.n.* (TEX).

*Oxalis intermedia* is recognized by its large, green, obtriangular leaves (usually with acute angles), numerous, small, purplish flowers, and clusters of bulblets. It “reproduces chiefly by bulblets as all of the collections are seed sterile except for two specimens from Veracruz” (Denton 1973, p. 556). *Oxalis intermedia* has been treated as a synonym of *O. latifolia* by Lourteig (1980), Howard (1988), Liogier (1988), and Wunderlin and Hansen (2008), but in the assessment here, and following Adams (1972), Denton (1973), Correll & Correll (1982), and Ward (2004), they are different species. The native range of *O. latifolia* is Central America and Mexico, reaching into Arizona, New Mexico, and Texas of the southwestern USA (see discussion above); compared to *O. intermedia*, it generally has smaller, differently shaped leaves and differs in its reproductive biology and ecology.

1. Leaflets obtriangular to broadly obtriangular, (20–)30–50 mm long, 1.5–2.5(–3) times wider than long; stems and leaves arising from a cluster of small sessile bulblets; capsules and seeds rarely formed; flowers semi-homostylous; West Indies, and Veracruz, Mexico, introduced in southeastern USA.....***Oxalis intermedia***
  1. Leaflets obcordate to obtriangular, 15–40 mm long, 1.1–2(–3) times wider than long; stems and leaves usually arising from a single bulb, rarely producing additional sessile bulblets; capsules and seeds often formed; flowers tristylous, rarely homostylous; southwestern USA, Mexico, Central America south to Panama.....***Oxalis latifolia***
9. ***Oxalis triangularis*** A. St.-Hil., Fl. Bras. Merid. (qto. ed.) 1: 102. 1825. **TYPE:** Brasil. Rio de Janeiro, inter saxa ad ripas fluvii uba, alt. circiter 600 p., Voyage 1816-21, *St. Hilaire A1 585 X* (holotype: P; isotype: P). Fide Lourteig (2000).
- Oxalis triangularis* A. St.-Hil. subsp. *papilionacea* (Hoffmannsegg ex Zucc.) Lourteig, in L.B. Smith, Fl. Ill. Catarin., Oxalidaceae 101. 1983. *Oxalis papilionacea* Hoffmannsegg ex Zucc., Akad. Wiss.

- Wien, Math.-Naturwiss. Kl., Denkschr. 9: 148. 1825. **TYPE:** Brasil. Pará, im unbrosis, *Hoffmannsegg ex herb. Martii 18* (holotype: M). Fide Lourteig (2000).
- Oxalis palustris* A. St.-Hil., Fl. Bras. Merid. (qto. ed.) 1: 127. 1825. **TYPE:** Brasil. Minas Gerais, Desert du Río S. Francisco, contendas, marais après Olho d'Água, in paludosis, Voyage 1816-21, *St. Hilaire* (holotype: P; isotype: P). Fide Lourteig (2000).
- O. regnellii* Miq., Linnaea 22: 545. 1849. **TYPE:** Brasil. Caldas, *Regnell 1143* (holotype: S; isotype: P). Fide Lourteig (2000).
- O. catharinensis* N.E. Br., Gard. Chron. ser. 3, 1: 140. 1887. *Oxalis regnellii* var. *catharinensis* (N.E. Br.) Norlind, Ark. Bot. 14: 10. 1915. **TYPE:** Brasil. Santa Catarina, cult. in Kew Gard., 1887, *N.E. Brown* (holotype: K). Fide Lourteig (2000).

Plants perennial, acaulescent, arising from short, branching rhizomes ca. 1 cm in diam. and covered with thickened, overlapping scales, sometimes with a cluster of bulblets at the rhizome base, rarely without leaves; rhizome and bulb scales (1–)3-nerved, glandular along the margins. **Leaves** all basal; leaflets 3, obtriangular to obovate-triangular, (20–)30–50(–60) mm, lobed ca 1/10 length or apex merely notched, lobes apically truncate to slightly convex, dark purple on both surfaces, commonly with lighter violet splotches adaxially, radiating from the midvein, oxalate deposits absent or as short, filiform, marginal lines on both sides of the notch, petioles 12–20 cm. **Flowers** (1–)2–5(–9) in umbelliform cymes, heterostylous; scapes 15–35 cm; sepal apices with a pair of orange tubercles; petals 15–22 mm, white to pinkish or pale purple. **Capsules** ovoid-ellipsoid, 12–18 mm.  $2n =$  unknown.

Flowering Apr–May. Disturbed sites, near gardens; 5–100 m. Native to South America (Argentina, Bolivia, Brazil, Paraguay, Peru?). Introduced in Florida and Louisiana.

In East Feliciana Parish, Louisiana, north of Baton Rouge, *Oxalis triangularis* has spread from a planter pot into adjacent woods (Gerald Guala, pers. comm.). In Leon County, Florida, a population is growing and slowly spreading at the edge of a woodland remnant within the city of Tallahassee (Loran Anderson, pers. comm.).

Lourteig (2000) recognized two subspecies closely sympatric over much of their native ranges (as cited, subsp. *triangularis* in Argentina, Bolivia, Brasil, and Paraguay, subsp. *papilionacea* in Bolivia, Brasil, Paraguay, and Peru) and differing by the following contrasts.

- a. Sepals acute, oxalate tubercles small or absent; petals white to purplish, 3–4 times longer than the sepals...  
.....**Oxalis triangularis** subsp. **triangularis**
- a. Sepals obtuse to subacute, oxalate tubercles thickened; petals pink to purplish, rarely white, about 2–2.5 times longer than the sepals...  
.....**Oxalis triangularis** subsp. **papilionacea**

I have seen relatively few collections of *O. triangularis* in this study, but with these subtle differences and broad sympatry, it seems probable that only a single evolutionary entity exists. In any case, the few North American cultivated collections studied here would be *O. triangularis* sensu stricto. Forms of *O. triangularis* are sometimes recognized as “*atropurpurea*” but this apparently is a horticultural name.

- 10. *Oxalis articulata*** Savigny in Lam., Encycl. 4: 686. 1797 [1798]. Uruguay. Montevideo, in pascuis, May 1767, *Commerson s.n.* (holotype: P-Juss.; isotype: P). Fide Lourteig (1982, 2000).  
*Oxalis rubra* A. St.-Hil., Fl. Bras. Merid. (quarto ed.) 1: 124. 1825.  
*Oxalis articulata* subsp. *rubra* (A. St.-Hil.) Lourteig, Phytologia 50: 137. 1982. **TYPE:** Brazil. “Inveni ad ripas rivulorum prope pagulum Freguesia Nova, in parte australi provinciae S. Pauli quam dicunt Campos Gerães. Floret Martio, Voyage 1816-21, *St. Hilaire C*<sup>2</sup> 1587 (holotype: P; isotype: P). Fide Lourteig (1982, 2000).

Plants perennial, acaulescent, sparsely strigose, arising from a thick, woody, irregularly nodulate-segmented rhizome often with persistent, thickened, and lignescent petiole bases. **Leaves** all basal; leaflets 3, rounded-obcordate, 18–20 mm, lobed 1/5–1/3 length, lobes apically convex, bright green above, slightly paler green to purplish beneath, evenly strigose-villous to strigose-hirsute on both surfaces, oxalate deposits concentrated mostly toward the margins or over the whole surface, margins densely loosely ciliate, petioles 11–30 cm.

**Flowers** 3–12 in umbelliform cymes (often up to 100 inflorescences per plant), less commonly in irregular cymes, heterostylous; scapes 12–28 cm; sepal apices with a pair of orange tubercles; petals 10–14 mm, purplish rose to red, sporadically white. **Capsules** ovoid, 4–8 mm.  $2n = 42$ .

Flowering Mar–Jul. Disturbed places, especially near gardens, lawns, fields, roadsides; 5–250 m. Native to South America (Argentina, Brazil, Uruguay). Naturalized in Alabama, Arkansas, California, Florida, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, Oregon, South Carolina, Texas, and Virginia; naturalized also in Europe, Australia, Pacific Islands (New Zealand). Lourteig (1982) also cited collections from Arizona, Maryland, Pennsylvania, and Washington; among these, the collection from Washington perhaps was from a naturalized population, the others surely cultivated.

This species in the USA commonly has been identified as *Oxalis rubra*. *Oxalis rubra* was treated as a subspecies of *O. articulata* by A. Lourteig (1982, 2000), but in her specimen citations and range descriptions, subsp. *articulata* and subsp. *rubra* have essentially the same native range and occur in similar habitats. Lourteig identified both subspecies in the USA, noting in her key that vestiture is reduced and the sepals are broader in subsp. *rubra*, but I am unable to distinguish two entities in the USA and evidence appears weak for recognizing more than a single entity. She recognized only *O. articulata*, without infraspecific taxa, in the Flora of Panama (Lourteig 1981).

The inclusion of Oregon in the naturalized range of *Oxalis articulata* is based on the following collection: Coos Co.: E end of Brandon, 3rd St. SE near Michigan Ave. SE, lawn weed, 25 m elev., 17 May 2004, Zika 19622 (MO).

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